North Central Forest Experiment Station 11.04

CENTRAL HARDWOOD NOTES

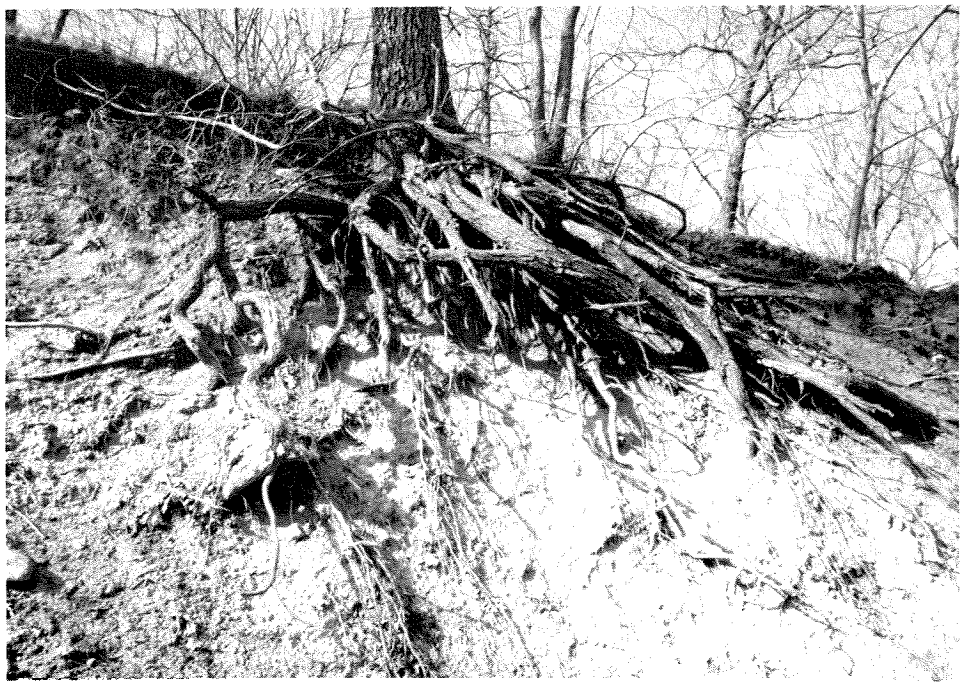
Grazing Effects On Soil And Water

In terms of animal nutrition and growth, there is little economic justification for grazing in hardwoods, though the trees do provide shade during hot weather. Some land managers who are not interested in growing hardwood timber see little reason to deny livestock full access to woodlands. And some grazing damage to soil and water probably is inevitable.

Litter on the forest floor is reduced by trampling and, along animal pathways, may be displaced sufficiently to expose mineral soil to locally serious erosion. Trampling compresses macropores in the upper few inches of soil, especially when soils are wet. Consequently, rates of infiltration and percolation are reduced, though seldom below the rates of the usual rainfall intensities. These effects do accelerate erosion, but soil losses exceeding 1 ton per acre per year rarely have been measured in carefully controlled experiments. Soil loss on the order of 1/20- to 1/1O-ton per acre per year is widely regarded as the geologic norm for the eastern forest region and losses ranging from 1 to 5 tons per acre per year are regarded as tolerable by the USDA Soil Conservation Service.

Through the years, forest owners and managers have been warned about the soil and water erosion caused by grazing. Indeed, such damage occurs but careful observation usually shows that active erosion is localized, commonly in places where too many animals have been restricted for too long on too small an area. This 'worst case" situation has tended to exaggerate soil loss as an incentive to get grazing animals out of hardwoods in order to optimize tree growth. To date, the far more common practice of widely dispersed grazing has not been shown to seriously accelerate erosion.

In earlier times, newly cleared forest sites often were cropped until some combination of depleted fertility and accelerated soil erosion rendered further cropping unprofitable. Without tillage, natural revegetation provided opportunity for grazing, which often continued throughout the entire course of succession from open fields to closed forests. Today, when people see animals grazing in a forest that has healed gullies or other evidence of former misuse, they conclude that current grazing accelerates erosion. True, the old gullies are there, but the discerning observer almost always finds them fully covered by litter and with trees growing in them-prima *facie* evidence that there is no overland flow and that there is little likelihood of erosion much above geologic rates. The healed gullies, the scars of practices long past, have been stabilized by decades of forest regrowth despite livestock roaming about in constant search of forage.



Too many animals on too small a space can cause active erosion such as on this grazed, steep slope (Harold Scholten).

Reduced water quality is unavoidable where animals have free access to forest streams. Deposit of body wastes directly into or close to water courses is an obvious source of pollution. Trampling stream banks and wading in channels increases the sediment load in streams. Fencing stream channels and immediate environs is an obvious way to maintain high water quality. Fencing not only protects the highly sensitive channels but establishes a filter strip to intercept sediment originating from upslope grazing.

Grazing harms most hardwoods through loss of foliage, small branches, bark, and by root trampling. It also reduces growth and makes trees more susceptible to decay, disease, and insects. Preferential browsing among small trees and seedlings alters stand composition, while heavy and prolonged browsing can eliminate all tree reproduction. The message is clear: don‘t graze stands if you want optimal hardwood reproduction and growth and no damage to soil and water.

In brief, forest grazing is rarely profitable in the central hardwood forest region. Where it is permitted, it will probably cause minor ill-effects on soil and water which can be minimized by fencing animals well away from streams or other water bodies. Most important, too many animals must not be confined for extended periods on too small an area (see Note 8.14 Grazing in Central Hardwood Forests).

References

Blackbum, W.H.; Knight, R.W.; Wood, M.K. 1982. Impacts of grazing on watersheds: a state of knowledge. Misc. Publ. MP-1496. College Station, TX: Texas Agricultural Experiment Station. 32 p.

Gifford, G.F.; Hawkins, R.H. 1978. Hydrologic impact of grazing on infiltration: a critical review. Water Resources Research. 14: 305313.

Patric, J.H.; Helvey, J.D. 1986. Some effects of grazing on soil and water in the eastern forest. Gen. Tech. Rep. NE-1 15. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 25 p

Smeins, F.E. 1975. Effects of livestock on runoff and erosion. In: Watershed management: proceedings of a symposium; 1975; New York, NY. Logan, UT: American Society of Civil Engineers: 267-274.

James H. Patric (Retired)
USDA Forest Service
Greenville, Tennessee